

27-OCT-09
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GEORGIA DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM
REVISED: JUNE 30, 2008
32' CURB-CURB; 4 BEAMS; 183' SPAN; 30' TALL; BRIDGE 7 ; PIER 9

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C S	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP						
OPTIONS											EC	ES	STRAIN	FACT	MAIN SIZE	STR SIZ	MAX TOP	MAX BOT	MIN SIZE	MIN NO.	TOP CL.	MIN S.SP	DEPTH INCR.	BOT CL.		
D	D	D	L	2	1	6	0-00-00	3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00

COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE	ALL.PILE
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	I
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	14.71	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999	P

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	17.625	4.000	4.000	6.000	6.000	4.000	13.625	14.000	9.333	0.667					

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	O	C	T		30.000	0.000	8.000	6.000	8.000	6.000	6.000	0.000	8	6	11	8	6	11	22	16	11	22	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	10.000	10.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND													* WIND ON PIER												
STANDARD	WIND	ON	SUPERSTRUCTURE	INTENSITIES	STANDARD	WIND	ON	LIVE	LOAD	INTENSITIES	LENGTHS	OF	LL	WIND	ON	LL	ARMS								
WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	TRANS.	LONGI.	APT	APL
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	183.0	183.0	17.084	17.084

MISCELLANEOUS FORCES												
CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW				
FT	FL	APT	APL	COEFFICIENT	COEFFICIENT	PT	PL					
16.232	6.756	17.084	17.084	0.00018000	0.00044000	0.000	0.000					

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	380.630	476.760	0.000	0.000	399.000	439.130						
LL01	1	25.890	72.350	0.000	0.000	70.430	135.520						
LL02	1	112.460	103.860	0.000	0.000	63.800	31.200						
LL03	2	33.060	107.620	0.000	0.000	116.700	166.710						
LL04	2	35.370	116.950	0.000	0.000	134.240	144.490						
LL05	2	114.250	176.210	0.000	0.000	117.780	43.920						
LL06	2	138.350	171.780	0.000	0.000	115.530	45.330						

COLUMN MOMENTS(KIP- FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE													* LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF			
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	30.000	0.000	0.000	0.000	6.000	1.000	30.000	30.000			
DEAD LOAD TOTAL	1	1900.270	456.094	0.000	-456.094	2073.070	8351.297	-8807.391	0.000	0.000	0.000	0.000			
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-155.956	-6.756	-318.100	-318.100			
CENT. FORCE 1 LN	1	0.000	-374.699	16.232	764.268	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
WIND ON SUBSTR.	1	0.000	-24.426	4.071	122.130	0.000	0.000	0.000	-70.356	-11.726	-351.780	-351.780			
GROUP 2 WIND 1 1	1	0.000	-1478.595	107.021	4047.099	0.000	0.000	0.000	-70.356	-11.726	-351.780	-351.780			
GROUP 2 WIND 1 2	1	0.000	-1478.595	107.021	4047.099	0.000	0.000	0.000	70.356	11.726	351.780	351.780			
GROUP 2 WIND 2 1	1	0.000	-1304.094	94.667	3576.103	0.000	0.000	0.000	-244.856	-24.080	-822.776	-822.776			
GROUP 2 WIND 2 2	1	0.000	-1304.094	94.667	3576.103	0.000	0.000	0.000	244.856	24.080	822.776	822.776			
GROUP 2 WIND 3 1	1	0.000	-1216.844	88.490	3340.604	0.000	0.000	0.000	-419.357	-36.434	-1293.772	-1293.772			
GROUP 2 WIND 3 2	1	0.000	-1216.844	88.490	3340.604	0.000	0.000	0.000	419.357	36.434	1293.772	1293.772			
GROUP 2 WIND 4 1	1	0.000	-984.177	72.018	2712.609	0.000	0.000	0.000	-535.690	-44.670	-1607.770	-1607.770			
GROUP 2 WIND 4 2	1	0.000	-984.177	72.018	2712.609	0.000	0.000	0.000	535.690	44.670	1607.770	1607.770			
GROUP 2 WIND 5 1	1	0.000	-518.843	39.074	1456.620	0.000	0.000	0.000	-622.940	-50.847	-1843.268	-1843.268			

PIER-32-4-183-30.OUT												
GROUP 2 WIND 5 2 1	0.000	-518.843	39.074	1456.620	0.000	0.000	0.000	622.940	50.847	1843.268	1843.268	
GROUP 3 WIND 1 1 1	0.000	-866.016	50.406	2075.767	0.000	0.000	0.000	-21.107	-3.518	-105.534	-105.534	
GROUP 3 WIND 1 2 1	0.000	-866.016	50.406	2075.767	0.000	0.000	0.000	21.107	3.518	105.534	105.534	
GROUP 3 WIND 2 1 1	0.000	-762.973	44.504	1831.072	0.000	0.000	0.000	-124.149	-9.420	-350.229	-350.229	
GROUP 3 WIND 2 2 1	0.000	-762.973	44.504	1831.072	0.000	0.000	0.000	124.149	9.420	350.229	350.229	
GROUP 3 WIND 3 1 1	0.000	-711.452	41.553	1708.724	0.000	0.000	0.000	-227.192	-15.322	-594.925	-594.925	
GROUP 3 WIND 3 2 1	0.000	-711.452	41.553	1708.724	0.000	0.000	0.000	227.192	15.322	594.925	594.925	
GROUP 3 WIND 4 1 1	0.000	-574.062	33.683	1382.463	0.000	0.000	0.000	-295.887	-19.257	-758.055	-758.055	
GROUP 3 WIND 4 2 1	0.000	-574.062	33.683	1382.463	0.000	0.000	0.000	295.887	19.257	758.055	758.055	
GROUP 3 WIND 5 1 1	0.000	-299.282	17.944	729.942	0.000	0.000	0.000	-347.408	-22.208	-880.403	-880.403	
GROUP 3 WIND 5 2 1	0.000	-299.282	17.944	729.942	0.000	0.000	0.000	347.408	22.208	880.403	880.403	
LIVE LOAD LL01	1	304.190	1525.859	0.000	-1525.859	304.190	700.117	-2225.977	0.000	0.000	0.000	0.000

COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	TRANSVERSE								LONGITUDINAL		
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
LIVE LOAD LL02	1	311.320	-1324.600	0.000	1324.600	311.320	2059.155	-734.555	0.000	0.000	0.000	0.000
LIVE LOAD LL03	1	424.090	1913.476	0.000	-1913.476	424.090	965.103	-2878.579	0.000	0.000	0.000	0.000
LIVE LOAD LL04	1	431.050	1608.373	0.000	-1608.373	431.050	1040.986	-2649.358	0.000	0.000	0.000	0.000
LIVE LOAD LL05	1	452.160	-1257.313	0.000	1257.313	452.160	2421.872	-1164.559	0.000	0.000	0.000	0.000
LIVE LOAD LL06	1	470.990	-1564.799	0.000	1564.799	470.990	2738.597	-1173.798	0.000	0.000	0.000	0.000

CAP ANALYSIS AND DESIGN DATA

POINT	MOMENTS(KIP-FEET)								SHEARS(KIPS)							
	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT			
P 1	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-19.222	-514.041	-19.222	-514.041	-19.222	-814.399			
P 2	-5135.613	-5135.613	-7938.852	-5135.613	-5135.613	-5135.613	-6814.199	-584.300	-1204.088	-584.300	-1204.088	-884.658	-1877.380			
P 3	-5940.788	-5940.788	-9193.113	-5940.788	-5940.788	-5940.788	-7888.288	-1210.255	-1210.255	-1210.255	-1210.255	-1883.547	-1883.547			
C 1L	-10856.686	-10856.686	-16802.180	-10856.686	-10856.686	-10856.686	-14416.862	-1247.694		-1247.694		-1920.987				
C 1R	-11449.607	-11449.607	-17699.002	-11449.607	-11449.607	-11449.607	-15191.760		1222.656		1837.940		1222.656			
P 4	-6633.862	-6633.862	-10422.124	-6633.862	-6633.862	-6633.862	-8902.282	1185.216	1185.216	1800.500	1800.500	1185.216	1185.216			
P 5	-5845.388	-5845.388	-9223.256	-5845.388	-5845.388	-5845.388	-7868.063	1179.050	660.350	1794.333	1022.277	1179.050	660.350			
P 6	-33.476	-33.475	-33.476	-33.476	-33.476	-33.476	-33.476	590.091	19.222	952.018	19.222	590.091	19.222			

PT.	CAP DESIGN DATA		LEFT STIRRUPS		RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE. AS NO.SIZE	BOT. REINFORCE. AS NO.SIZE	M.SP. AV/IN BAR&SPAC	M.SP. AV/IN BAR&SPAC					
P 1	-25.751	-25.751	3.12 2 # 11	3.12 2 # 11	0.00 0.000 #5@ 0.00	24.00 0.136 #5@ 4.56	60.77		0.08	0.000	0.098
P 2	-3950.471	-5241.692	20.12 13 # 11	3.12 2 # 11	24.00 0.060 #5@10.33	24.00 0.266D#5@ 4.67	93.65		0.34	0.638	1.074
P 3	-4569.837	-6067.914	22.76 15 # 11	3.12 2 # 11	24.00 0.257D#5@ 4.83	24.00 0.257D#5@ 4.83	96.00		0.38	0.620	1.005
C 1	-8351.297	-11685.970	45.64 30 # 11	3.12 2 # 11	24.00 0.267D#5@ 4.64	24.00 0.250D#5@ 4.97	96.00		0.74	0.690	0.896
P 4	-5102.971	-6847.910	25.93 17 # 11	3.12 2 # 11	24.00 0.239D#5@ 5.18	24.00 0.239D#5@ 5.18	96.00		0.43	0.637	0.981
P 5	-4496.452	-6052.356	23.47 16 # 11	3.12 2 # 11	24.00 0.248D#5@ 5.01	24.00 0.080 #5@ 7.76	93.65		0.40	0.602	0.947
P 6	-25.751	-25.751	3.12 2 # 11	3.12 2 # 11	24.00 0.183D#5@ 6.78	0.00 0.000 #5@ 0.00	60.77		0.08	0.000	0.098

NOTE: *** FS/FZ RATIO EXCEEDS 1.0! ***

COLUMN ANALYSIS AND DESIGN OUTPUT

CN	T	CRITICAL COLUMN LOADS																	
		B GR	LLC	WC R	E S	C F	S F	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T	1	LL06	0.0		C		3492.9	-3778.5	0.0	3492.9	4028.2	2336.1	10508.8	12140.4	7040.5	3.012	72.00	96.00
1	B	3	LL06	1.1		C		3307.3	6126.9	-964.3	3307.3	6483.1	2183.4	8398.9	16466.3	5545.7	2.540	72.00	96.00

CN	T	COLUMN DESIGN DATA															
		B FACE 1 NO.SIZE	B FACE 2 NO.SIZE	D FACE 3 NO.SIZE	D FACE 4 NO.SIZE	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC	
1	T	15 # 11	15 # 11	8 # 11	8 # 11	71.76	1.038	1.00	0.000	3605.	58150.	1.066	1.115	1.000	2	0.70	
1	B	15 # 11	15 # 11	8 # 11	8 # 11	71.76	1.038	1.00	0.000	3195.	58150.	1.058	1.100	1.000	2	0.70	

FOOTING 1 DESIGN LOADS

F G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
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PIER-32-4-183-30.OUT																	
1	3	LL06	3.1	C	2483.662	4145.300	74.017	-1231.124	-28.834	155.764	114.829	252.300	293.235	216.398	-0.763	48.239	MAX.P1
1	3	LL06	1.1	C	3228.760	5866.045	107.731	-964.253	-22.139	183.709	151.722	346.774	378.761	288.257	-0.992	62.710	MAX.MT
1	3	LL06	1.1	C	3228.760	5866.045	107.731	-964.253	-22.139	183.709	151.722	346.774	378.761	288.257	-0.992	62.710	MAX.VT
1	3	LL06	1.1	C	3228.760	5866.045	107.731	-964.253	-22.139	183.709	151.722	346.774	378.761	288.257	-0.992	62.710	MAX.VP
1	3	LL06	4.1	C	3228.760	4964.751	85.992	-1812.530	-42.600	213.294	153.002	317.189	377.481	287.272	56.170	62.710	MAX.ML
1	3	LL06	4.1	C	3228.760	4964.751	85.992	-1812.530	-42.600	213.294	153.002	317.189	377.481	287.272	56.170	62.710	MAX.VL
1	2		1.1R		2073.070	-4503.193	-107.021	351.780	11.726	103.875	91.591	245.533	257.817	198.484	-0.763	40.567	MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE			* BAR REINFORCEMENT STEEL *						SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
18.250	18.250	5.750	0.998	1.25	23 # 9	@ 9.500	TOP LONG	290.645	63.130	126.259	52.308	0.000
				1.22	23 # 9	@ 9.500	BOT.TRAN	297.042	64.491	128.982	53.436	0.000

NUMBER OF PILES = 14 BP = 2.625 DP = 2.625